Nuclear data evaluations for JENDL high-energy file

Yukinobu Watanabe[1], Tokio Fukahori[2]

[1] *Department of Advanced Energy Engineering Science, Kyushu University,Kasuga, Fukuoka, 816-8580, Japan*
[2] *Nuclear Data Center, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki, 319-1195, Japan*

High-energy cross section data above 20 MeV are required for various applications involving high-energy neutrons and protons, *e.g.*, accelerator-driven transmutation of nuclear waste and energy production, radiotherapy of cancer, and soft-error effects in microelectronics, *etc.* In this report, an overview is presented of recent nuclear data evaluations performed for the JENDL high-energy (JENDL-HE) file, in which neutron and proton cross sections for energies up to 3 GeV will be stored for 132 nuclides. The current version of the JENDL-HE file contains neutron total cross sections, nucleon elastic scattering cross sections and angular distributions, non-elastic cross sections, production cross sections and double-differential cross sections of secondary light particles (n, p, d, t, ^{3}He, α, and π), isotope production cross sections, and fission cross sections. The evaluations are performed on the basis of experimental data and theoretical model calculations. Since the experimental data are not enough in the incident energy region above 20 MeV, particularly for neutron-induced reactions, the nuclear model calculations play an important role in the high-energy cross section evaluations. We have developed a hybrid calculation code system utilizing some available nuclear model codes and systematics-based codes. A major code used for the intermediate energy range below 150 to 250 MeV is the GNASH code which is based on statistical Hauser-Feshbach plus preequilibrium exciton models. Optical model calculation codes such as ECIS and OPTMAN are also employed. For higher incident energy range, we use a microscopic simulation code (either JQMD or JAM) based on the quantum molecular dynamics or the intra-nuclear cascade model for dynamical processes and the evaporation model for the following statistical decay processes. The systematics-based codes, TOTELA and FISCAL, are also used for total, elastic scattering and reaction cross sections and angular distributions of elastic scattering, and fission cross sections. The evaluated cross sections are compared with the available experimental data and the other evaluations, with a focus on the influences of recent relevant measurements on the present evaluations. Future plans of our JENDL-HE project are also discussed along with prospective needs of high-energy cross section data.

Email: watanabe@aees.kyushu-u.ac.jp